

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 21851PC THER	<b>FOR FURTHER ACTION</b>	
	See Form PCT/IPEA/416	
International application No. PCT/EP2005/000968	International filing date ( <i>day/month/year</i> ) 01.02.2005	Priority date ( <i>day/month/year</i> ) 06.02.2004
International Patent Classification (IPC) or national classification and IPC INV. F25B17/08 F25D31/00 F16K15/02 F16K15/18		
Applicant THERMAGEN S.A. et al.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 3 sheets, as follows:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the report</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>		
Date of submission of the demand  06.12.2005	Date of completion of this report  17.05.2006	
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer  Yousufi, S Telephone No. +31 70 340-2823	



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ON PATENTABILITY**

International application No.  
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**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on

- the international application in the language in which it was filed
- a translation of the international application into , which is the language of a translation furnished for the purposes of:
  - international search (under Rules 12.3(a) and 23.1(b))
  - publication of the international application (under Rule 12.4(a))
  - international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-10 as originally filed

**Claims, Numbers**

2-15, 17 as originally filed  
1, 16 filed with telefax on 06.12.2005

**Drawings, Sheets**

1/8-8/8 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to sequence listing (*specify*):

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- the description, pages
- the claims, Nos.
- the drawings, sheets/figs
- the sequence listing (*specify*):
- any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superceded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N) Yes: Claims 1-17

No: Claims

Inventive step (IS) Yes: Claims 1-17

No: Claims

Industrial applicability (IA) Yes: Claims 1-17

No: Claims

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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International application No.

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**Re Item V.**

- 1 Reference is made to the following document:  
D3 : WO 03/073019 A (FRANTZ LIONEL ; THERMAGEN (FR); JEUCH PIERRE (FR); KHAIRALLAH FADI (FR) 4 September 2003 (2003-09-04)
- 2 Document D3, which is considered to represent the most relevant state of the art, discloses (the references in parentheses applying to this document):  
A self cooling packaging with
  - a cavity forming a heat exchanger (20) and containing a refrigerant liquid and the vapour thereof;
  - a cavity forming an adsorption chamber (30) for pumping of the vapour;
  - connection means (40) provided in a common wall (25) of the cavities (20, 30), the connection means having a check valve (42);
  - actuating means (45) disposed on the side of the adsorption chamber cavity (30) and adapted to push the check valve (42) inside the heat exchanger cavity (20) to an initial partly open position defining a restraint path for vapour of the refrigerant liquid (see page 9, lines 12-17);
  - in the second position, when overpressure has decreased, the check valve (42) falls inside the heat exchanger cavity (20) releasing a bigger opening for the vapour of the liquid refrigerant (see page 9, lines 18-22).

From this, the subject-matter of independent claim 1 differs in that:

Spring means (43) adapted to progressively push the check valve (42) further inside the heat exchanger cavity (20) from its initial partly open position to a fully open position are provided.

- 2.1 The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).  
The problem to be solved by the present invention may be regarded as:  
Avoiding of drops of liquid being pumped together with vapour to be drawn towards the adsorption chamber (30).

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2.2 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

It is not rendered obvious from the available prior art to prevent a sharp increase in the vapour flow rate towards the adsorption chamber cavity (30), and thus preventing drops of liquid to flow with the vapour inside the adsorption chamber cavity (30), by using spring means (43) to progressively push the check valve (42) from its initial partly open position to a fully open position.

2.3 Claims 2-15 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

3 Document D3, which is considered to represent the most relevant state of the art, discloses (the references in parentheses applying to this document):  
A method for cooling the content of a self cooling packaging, the packaging has  
-a cavity forming a heat exchanger (20) and containing a refrigerant liquid and the vapour thereof;  
-a cavity forming an adsorption chamber (30) for pumping of the vapour;  
-connection means (40) provided in a common wall (25) of the cavities (20, 30), the connection means having a check valve (42);  
-actuating means (45) disposed on the side of the adsorption chamber cavity (30);  
the method comprising the steps of:  
-pushing the check valve (42) inside the heat exchanger (20) to an initial partly open position under the action of the actuating means (45);  
-pumping the vapour of the refrigerant liquid from the heat exchanger cavity (20) to the adsorption chamber cavity (30).

From this, the subject-matter of independent claim 16 differs in that:  
progressively pushing of the check valve (42) further inside the heat exchanger to a larger opening with respect to the decrease of the pressure inside the heat exchanger cavity (20) under the action of spring means (43) is provided.

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3.1 The subject-matter of claim 16 is therefore novel (Article 33(2) PCT).  
The problem to be solved by the present invention may be regarded as:  
Avoiding of drops of liquid being pumped together with vapour to be drawn towards  
the adsorption chamber (30).

3.2 The solution to this problem proposed in claim 16 of the present application is  
considered as involving an inventive step (Article 33(3) PCT) for the following  
reasons:  
It is not rendered obvious from the available prior art to prevent a sharp increase in  
the vapour flow rate towards the adsorption chamber cavity (30), and thus preventing  
drops of liquid to flow with the vapour inside the adsorption chamber cavity (30), by  
progressively pushing of the check valve (42) to a larger opening with respect to the  
decrease of the pressure inside the heat exchanger cavity (20) under the action of  
spring means (43).

3.3 Claim 17 is dependent on claim 16 and as such also meets the requirements of the  
PCT with respect to novelty and inventive step.

4 The application is industrially applicable for claims 1-17 according to Article 33(4)  
PCT.

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CLAIMS

## 1. A self cooling packaging comprising:

- a cavity forming a heat exchanger (20) and containing a refrigerant liquid and the vapour thereof;
- a cavity forming an adsorption chamber (30) for pumping of said vapour;
- connection means (40) provided in a common wall (25) of said cavities (20, 30), said connection means comprising a check valve (42);
- actuating means (45) disposed on the side of the adsorption chamber cavity (30) and adapted to push the check valve inside the heat exchanger cavity (20) to an initial partly open position;
- spring means (43) adapted to progressively push the check valve (42) further inside the heat exchanger cavity (20) from its initial partly open position to a fully open position.

15 2. The self cooling packaging according to claim 1, wherein the check valve (42) is adapted to withstand pressure exerted on the side of the heat exchanger cavity (20) and can be opened inside said heat exchanger cavity (20) under the effect of a force exerted by said actuation means (45) and said spring means (43).

20 3. The self cooling packaging according to claim 1 or 2, wherein the spring means (43) are at rest when said connection means are in a closed position and are loaded by said actuating means (45) in the initial opening position.

4. The self cooling packaging according to any one of claims 1 to 3, wherein the spring means (43) are part of the actuating means (45).

25 5. The self cooling packaging according to any one of claims 1 to 3, wherein the spring means (43) are part of the connexion means (40).

6. The self cooling packaging according to any one of claims 1 to 5, wherein the actuating means comprise a plunger rod (45).

30 7. The self cooling packaging according to claim 6, wherein the spring means (43) have a spring stroke comprised between 0.5 and 0.7 of the actuator plunger rod (45) stroke.

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8. The self cooling packaging according to any one of claims 1 to 7, wherein the spring means (43) comprise a helical spring.
9. The self cooling packaging according to any one of claims 1 to 7, wherein the spring means (43) comprise a tongue.
- 5 10. The self cooling packaging according to any one of claims 1 to 9, wherein the check valve (42) has a plate disk shape.
11. The self cooling packaging according to any one of claims 1 to 9, wherein the connection means (40) comprise a conical shape check valve (42) and a conical shape valve seat (44) formed in the common wall (25).
- 10 12. The self cooling packaging according to claim 11, wherein the conical shape has an angle ( $\alpha$ ) with respect to the common wall (25) comprised between 15° and 30°.
13. The self cooling packaging according to any one of claims 1 to 9, wherein the connection means (40) comprise a sealing member (41) being compressed in a storage position in a direction perpendicular to the check valve (42) opening direction.
- 15 14. The self cooling packaging according to any one of claims 1 to 13, further comprising a liquid/gas state separating device (50) disposed in the heat exchanger cavity (20).
15. The self cooling packaging according to claim 14, wherein said liquid/gas state separating device (50) defines a solid angle that includes the connection means (40).
- 20 16. A method for cooling the content of a self cooling packaging, said packaging comprising:
  - a cavity forming a heat exchanger (20) and containing a refrigerant liquid and the vapour thereof;
  - a cavity forming an adsorption chamber (30) for pumping of said vapour;
- 25 - connection means (40) provided in a common wall (25) of said cavities (20, 30), said connection means comprising a check valve (42);
  - actuating means (45) disposed on the side of the adsorption chamber cavity (30);
  - spring means (43);
- the method comprising the steps of:
  - pushing the check valve (42) inside the heat exchanger (20) to an initial partly open
- 30

position under the action of said actuating means (45);

- pumping the vapour of the refrigerant liquid from the heat exchanger cavity (20) to the adsorption chamber cavity (30);

- progressively pushing the check valve (42) further inside the heat exchanger (20) to a larger opening with respect to the decrease of the pressure inside the heat exchanger cavity (20) under the action of said spring means (43).

17. A method according to claim 16, comprising the step of further dropping the check valve (42) inside the heat exchanger cavity (20) when the pressure therein has decreased to below a threshold value.